

EVALUATION OF STREAM IMPROVEMENT STRUCTURES
PROGRESS REPORT 1963: FIRST YEAR

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WILDLIFE HABITAT

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FIRST YEAR

REGION THREE



By

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EVALUATION OF STREAM IMPROVEMENT STRUCTURES

Introduction:

During the 1930's a program was inaugurated by the Civilian Conservation Corps (CCC) to improve the habitat on several streams located within the National Forest boundaries of Region Three. These improvements consisted of log structures placed across the stream at several different locations. The structures were well built and formed many fine pools. The present available information would indicate that over 1,600 of these CCC structures were installed; of these, approximately 470 are still functioning properly. This could be considered good as very little if any maintenance work was done on these structures over the years. Several new projects have been approved to reconstruct and repair some of the old structures.

Nothing more was done to improve the habitat by means of structures on National Forest lands until 1955. From 1955 to 1959 the New Mexico Department of Game and Fish began a small program of installing several structures. These structures were different from anything else used in the past. They consisted of hog wire and steel stakes; the debris or trash flowing in the stream would catch against the wire and form a seal. Approximately 117 of these trash catchers were installed during this period, along with 90 log and rock structures.

From 1960 to 1963 inclusive, approximately 2,500 structures have been installed on National Forest lands in Region Three. The New Mexico Department of Game and Fish has installed about 1,000 of the above, with Forest crews installing the other 1,500.

Evaluation Study:

In Region Three, 50 streams are known to have over 3,000 effective structures at the present time. Several of these streams were such that no fishery existed; these streams now provide a limited sport fishery. This is an example of a definite benefit by the installation of these stream improvement structures. Other streams, which now have structures, did have a fishery. These structures were installed for one or more of the following benefits:

1. To slow down the flow.
2. To increase the bottom and surface area by creating pools.
3. To retain fishing waters during the dry period.
4. To provide needed shelter.
5. To increase the oxygen supply.
6. To increase the food supply.
7. Other.

The benefit derived from the structure may actually not be a benefit in relationship to some other biological or chemical factor. Some of these factors might be the temperature, algae, food, siltation, etc. A stream in need of pools might be affected by increasing the water temperature after the installation of structures.

In order to manage these streams to the best of our ability, it becomes necessary to evaluate the end results of this kind of program. This limited study has been set up in an attempt to get some of this needed information along with data pertaining to the type of structure and proper installation. It is felt that another two years will be needed to properly evaluate and finalize a conclusive report to this study. This report is the first year of a proposed three-year study.

Objective:

To properly evaluate the physical, chemical and biological aspects of the stream improvement structure. This will include the effectiveness and durability of the various kinds of structures; and the chemical and biological effects (such as siltation, water quality, food, and temperatures) of the streams.

Procedure:

The selection of eight streams on four of the National Forests in New Mexico that have had recent stream improvement structures installed. Selection based on 85% new work, different structure installations, prior temperature and water quality data, and geographical locations. Two individual structures on each of the eight selected streams, these are representative of the others and are spaced near extreme opposite ends of the improvement portion of the stream. These evaluation sites have been marked, with paint and an aluminum tag bearing the site number, at two separate locations (on the structure itself and on a tree or large boulder nearest the structure) to provide positive identification for future use. Temperature and water chemistry tests have been made at each of the selected sites; depth measurements were recorded above, below and to each side of the structure pool; and insect samples were taken (10 minute drift) in each pool.

In addition to the above sixteen structure sites, eight control sites were selected in a portion of the stream free of any improvements. These control sites are used as a basis for comparing the biological and chemical data. Effectiveness and durability of each selected structure has been recorded and documented by means of a black and white photograph. In order to get the most from this limited study, it is planned to evaluate each of the 24 sites twice a year, from May through October.

Explanation of Data:

The installation of the structures mentioned in the introduction has been one of complete cooperation and coordination between the New Mexico Department of Game and Fish and the Forest Service. On two of the eight streams in this study, the Game and Fish installed the structures; the others were installed by Forest Service crews with some of the projects partially financed by the Game and Fish Department.

Three different types of structures are being evaluated in this study. Within these types are several modifications or kinds of installations. The types in use are the log, gabion (wire basket) and trash catcher. Some of the modifications or kinds are the single and double log, notched and unnotched log; trash catcher with wire only, with wire and rock, and with wire, rock and plastic liners; the gabion with a notch in center and without distinct notching. Other kinds are also being evaluated within the region but are not included in this study.

This first report is designed so that NEXT YEAR'S data sheets can be inserted in their proper place in this report. The final report, tentatively planned to include calendar year 1965, will be such that the findings and conclusions will cover the entire study period; it is also possible that the physical change of the structure will be such that a new series of photos will be included for visual comparison.

Findings and Conclusions (1963):

No firm conclusions can be made this early in the study; however, some of the first year findings are such that they may be an indicator of the final results. These are listed as follows:

1. Trash catchers - Those with hog wire and rock only are not catching as rapidly as the log or gabion. Those with plastic liners are functioning very well. Experiments with chicken wire on top of the hog wire are also working better than the plain hog wire. The trash catcher is the cheapest type to construct.
2. Log - The log structure is more solid than the trash catcher and should possibly be considered in a stream which has rapid runoff. Wire or plastic used on upstream side and on bottom are functioning better than plain logs only. Cost is over twice as much as trash catcher.

3. Gabion - A very solid structure and appears to be working well. The cost is higher than the trash catcher or log, especially if rock material must be hauled in.
4. Site 1-S - Stream flow less. Too early for conclusions.
5. Site 2-S - Very good pools on right side. Looks good.
6. Site 3-S - Pool area over 15 inches deep. Looks good.
7. Site 4-S - Same as 3-S.
8. Site 5-S - Silt condition above, nice pool forming below. (This stream not stocked prior to improvement.)
9. Site 6-S - Same conditions as 5-S but not completely sealed as yet.
10. Site 7-S - Silt conditions above, forming nice pools below. (This stream had no fishery prior to installation of structures.) Trash catcher not sealing too well, water inflow practically non-existent during dry part of the year. Control site was completely dried up during October.
11. Site 8-S - Same as 7-S.
12. Site 9-S - Double log with plastic liner, beginning to fill and form nice pools above and below. Aquatic insects abundant for this time of year (October).
13. Site 10-S - Trash catcher not catching too well at present. Very little silt with a pool forming above.
14. Site 11-S - Very fine pools forming below. Plastic liner working well.
15. Site 12-S - Two photos are shown for comparison purposes. The October photo shows the site after heavy rains washed silt in from a new road built above the area. Very little, if any benefit will be derived from this portion of stream. The upper portion (Site 11-S and 6-C) was not affected by this road. The August photo shows nice pools before rains came. Structures are all brand new.
16. Site 13-S - Silting on top, nice pool below.
17. Site 14-S - Working well at present. Water flow slowed down considerably, however, temperatures about the same.

18. Site 15-S - Very little silt, deep pool above. Structure working well.
19. Site 16-S - Silting in on top. This is also a trash catcher type. Presently looks good.

All the structures with the exception of the gabion are from 10 to 16" in height. In most cases this appears to be ample and also allows for upstream movement of the trout. The gabions are from 16 to 30 inches high, no problem of fish migration is expected as it is a seasonal fishery only and the road parallels the entire improvement portion of the stream for easy stocking distribution.

The New Mexico Game and Fish Department stocks all of these streams on an annual catchable trout basis. The distribution costs will no doubt rise as it will take longer to stock these streams. No stream improvement structures are being installed in natural pool areas, only those streams or portions of streams which do not have pools are being considered for this type of improvement.

In those streams carrying a heavy silt load, other watershed practices will have to be considered in order to provide a good fishery.

Next year's study should add considerably to a more conclusive evaluation of this type of stream improvement project.

RIO PUEBLO

The Rio Pueblo is located on the Carson National Forest in Taos County, New Mexico. The portion of stream lying within the forest boundary is approximately 25 miles in length, 14 of which are in private ownership. The headwaters rise near Holman Hill on the Mora-Taos county line and flow in a northwesterly direction through spruce, fir, aspen, pine and open meadow country. Shortly after leaving the forest boundary, it enters the Embudo Creek above the town of Dixon.

This stream is stocked annually with rainbow and brown trout; a population of cutthroat also exists in the upper portion and in some of the tributary streams. The section of stream mentioned in this report is near the upper end in Twp. 22 N. and R. 13 E. This area is at an elevation between 8,300 and 8,800 feet. Located in this same general area is the Agua Piedra and Angostura forest camp and picnic grounds. Two hundred trash catcher and log type structures were installed in this stream by the New Mexico Department of Game and Fish crews in 1962.

UNIMPROVED PORTION OF STREAM

STREAM: Rio Pueblo FOREST: Carson
 DATE(S) OF EVALUATION: October 1963 CONTROL SITE #: 1-C

WATER ANALYSIS:

Date <u>July 10, 1963</u>	Time <u>1200</u>
Water Temp. <u>61°F</u>	Air Temp. <u>68°F</u>
Oxygen <u>--</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>136 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>140 ppm</u>	pH <u>8.65</u>
Turbidity <u>--</u>	Sulfates <u>--</u>

Date <u>October 22, 1963</u>	Time <u>0945</u>
Water Temp. <u>41°F</u>	Air Temp. <u>46°F</u>
Oxygen <u>8.8</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>136 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>136 ppm</u>	pH <u>8.10</u>
Turbidity <u>0.0</u>	Sulfates <u>35 ppm</u>

STREAM WIDTH: 20 ft. STREAM FLOW: 1.5 F/S

DEPTH MEASUREMENTS (facing downstream):

1/3 L 8" M 10.5" 1/3 R 5.5"

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis) <u>1</u>	Plecoptera (Stonefly) <u>5</u>
Ephemeroptera (Mayfly) <u>---</u>	Coleoptera (Beetle) <u>---</u>
Hemiptera (Bugs) <u>---</u>	Diptera (Fly) <u>1</u>
Annelida (Leech) <u>---</u>	Other <u>---</u>



Rio Pueblo Site #1-C



Rio Pueblo Site 1-S



Rio Pueblo Site 2-S

STREAM IMPROVEMENT STRUCTURE

STREAM: Rio Pueblo FOREST: Carson

DATE INSTALLED: 1962 DATE EVALUATED: October 1963

CONDITION OF STRUCTURE: Good

TYPE OF STRUCTURE: Single Log EVALUATION SITE #: 1-S

WATER ANALYSIS: (before and after installation, note dates)

Date July 18, 1962 Time --
 Water Temp. 50° F Air Temp. --
 Oxygen 8.2 Carbon Dioxide (T)
 Alkalinity (MO) 119 ppm (Phth) 0.0
 Hardness -- pH 7.80
 Turbidity 10 ppm Sulfates 38 ppm

Date July 10, 1963 Time 0800
 Water Temp. 54° F Air Temp. 59° F
 Oxygen -- Carbon Dioxide (T)
 Alkalinity (MO) 136 ppm (Phth) 0.0
 Hardness -- pH 8.45
 Turbidity -- Sulfates --

Date October 22, 1963 Time 1245
 Water Temp. 50° F Air Temp. 52° F
 Oxygen 7.2 Carbon Dioxide (T)
 Alkalinity (MO) 136 ppm (Phth) 0.0
 Hardness 136 ppm pH 8.25
 Turbidity 0.0 Sulfates 45 ppm

STREAM WIDTH: 13 ft. STREAM FLOW: .4 F/S

DEPTH MEASUREMENTS (facing downstream):

Six feet downstream	1/3 L	<u>2.5"</u>	M	<u>4"</u>	1/3 R	<u>5"</u>
One foot downstream	1/3 L	<u>4</u>	M	<u>11.5</u>	1/3 R	<u>8</u>
Six feet upstream	1/3 L	<u>7.75</u>	M	<u>12</u>	1/3 R	<u>6.5</u>
One foot upstream	1/3 L	<u>9.25</u>	M	<u>11</u>	1/3 R	<u>9.75</u>

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis fly) _____
 Plecoptera (Stonefly) 4
 Ephemeroptera (Mayfly) _____
 Coleoptera (Beetle) _____
 Hemiptera (Bug) _____
 Diptera (Fly) _____
 Annelida (Leech) _____ Other 2

STREAM IMPROVEMENT STRUCTURE

STREAM: Rio Pueblo FOREST: Carson

DATE INSTALLED: 1962 DATE EVALUATED: October 1963

CONDITION OF STRUCTURE: Good

TYPE OF STRUCTURE: Trash Catcher EVALUATION SITE #: 2-S

WATER ANALYSIS: (before and after installation, note dates)

Date	July 18, 1962	Time	-
Water Temp.	50° F	Air Temp.	-
Oxygen	8.2	Carbon Dioxide	(T)
Alkalinity (MO)	119 ppm	(Phth)	0.0
Hardness	-	pH	7.80
Turbidity	10 ppm	Sulfates	38 ppm

Date	July 10, 1963	Time	1000
Water Temp.	58° F	Air Temp.	66° F
Oxygen	-	Carbon Dioxide	(T)
Alkalinity (MO)	136 ppm	(Phth)	0.0
Hardness	-	pH	8.50
Turbidity	-	Sulfates	-

Date	October 22, 1963	Time	1030
Water Temp.	44° F	Air Temp.	51° F
Oxygen	8.2	Carbon Dioxide	(T)
Alkalinity (MO)	136 ppm	(Phth)	0.0
Hardness	144 ppm	pH	7.90
Turbidity	0.0	Sulfates	37 ppm

STREAM WIDTH: 35 ft. STREAM FLOW: 1 F/S

DEPTH MEASUREMENTS (facing downstream):

Six feet downstream	1/3 L	4"	M	9.50"	1/3 R	3.75"
One foot downstream	1/3 L	9.50	M	12.50	1/3 R	11.25
Six feet upstream	1/3 L	13	M	16.75	1/3 R	17.75
One foot upstream	1/3 L	8	M	13	1/3 R	13

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis fly)	
Plecoptera (Stonefly)	4
Ephemeroptera (Mayfly)	1
Colleoptera (Beetle)	
Hemiptera (Bug)	
Diptera (Fly)	
Annelida (Leech)	Other

EL RITO CREEK

El Rito Creek is located on the Carson National Forest in Rio Arriba County, New Mexico. The portion of stream lying within the forest boundary is approximately twenty-eight miles in length, thirteen of which is in private ownership. The headwaters rise north of the Canjilon Mountains and flow in a southerly direction through spruce, fir, aspen, pine and open meadow country. Shortly after leaving the forest boundary it enters the Chama River below the town of Abiquiu.

This creek is stocked annually with catchable rainbow trout by the New Mexico Department of Game and Fish. The portion of stream mentioned in this report is midway downstream in Twp. 25 N. and R. 6 E. This section of the creek is at an elevation of approximately 7,600 feet. Located in this same area is the El Rito forest camp and picnic grounds. Thirty-eight trash catcher type stream improvement structures were installed by Forest Service crews in Fiscal Year 1963 (calendar year 1962).

UNIMPROVED PORTION OF STREAM

STREAM: El Rito FOREST: Careson
 DATE(S) OF EVALUATION: October 1963 CONTROL SITE #: 2-C

WATER ANALYSIS:

Date <u>May 16, 1963</u>	Time <u>1300</u>
Water Temp. <u>60° F</u>	Air Temp. <u>76° F</u>
Oxygen <u>---</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>51 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>51 ppm</u>	pH <u>7.85</u>
Turbidity <u>10 ppm</u>	Sulfates <u>15 ppm</u>

Date <u>October 21, 1963</u>	Time <u>1215</u>
Water Temp. <u>49° F</u>	Air Temp. <u>58° F</u>
Oxygen <u>10.2</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>68 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>51 ppm</u>	pH <u>7.90</u>
Turbidity <u>10 ppm</u>	Sulfates <u>7 ppm</u>

STREAM WIDTH: 21 ft. STREAM FLOW: 1.3 F/S

DEPTH MEASUREMENTS (facing downstream):

1/3 L 4.75" M 9" 1/3 R 3.50"

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis)	Plecoptera (Stonefly)
Ephemeroptera (Mayfly)	Coleoptera (Beetle)
Hemiptera (Bugs)	Diptera (Fly)
Annelida (Leech)	Other



El Rito Site 2-C



El Rito Site 3-S



El Rito Site 4-S

STREAM IMPROVEMENT STRUCTURE

STREAM: El Rito FOREST: Carson

DATE INSTALLED: 1962 DATE EVALUATED: October 1963

CONDITION OF STRUCTURE: Very Good

TYPE OF STRUCTURE: Trash Catcher EVALUATION SITE #: 3-8

WATER ANALYSIS: (before and after installation, note dates)

Date <u>November 7, 1962</u>	Time <u>1000</u>
Water Temp. <u>38° F</u>	Air Temp. <u>47° F</u>
Oxygen <u>---</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>51 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>68 ppm</u>	pH <u>7.60</u>
Turbidity <u>---</u>	Sulfates <u>26 ppm</u>

Date <u>May 16, 1963</u>	Time <u>1100</u>
Water Temp. <u>58° F</u>	Air Temp. <u>75° F</u>
Oxygen <u>---</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>51 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>51 ppm</u>	pH <u>7.60</u>
Turbidity <u>10 ppm</u>	Sulfates <u>15 ppm</u>

Date <u>October 21, 1963</u>	Time <u>1030</u>
Water Temp. <u>50° F</u>	Air Temp. <u>58° F (rain)</u>
Oxygen <u>8.7</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>68 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>51 ppm</u>	pH <u>7.80</u>
Turbidity <u>10 ppm</u>	Sulfates <u>10 ppm</u>

STREAM WIDTH: 27 ft. STREAM FLOW: .3 F/S

DEPTH MEASUREMENTS (facing downstream):

Six feet downstream	1/3 L	<u>4.50"</u>	M	<u>10.25</u>	1/3 R	<u>10"</u>
One foot downstream	1/3 L	<u>7</u>	M	<u>11</u>	1/3 R	<u>9.50</u>
Six feet upstream	1/3 L	<u>11</u>	M	<u>14.25</u>	1/3 R	<u>16.25</u>
One foot upstream	1/3 L	<u>8.50</u>	M	<u>9.50</u>	1/3 R	<u>5</u>

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis fly) _____
 Plecoptera (Stonefly) _____
 Ephemeroptera (Mayfly) _____
 Coleoptera (Beetle) _____
 Hemiptera (Bug) _____
 Diptera (Fly) _____
 Annelida (Leech) _____ Other 1 (snail)

STREAM IMPROVEMENT STRUCTURE

STREAM: El Rito FOREST: Carson

DATE INSTALLED: 1962 DATE EVALUATED: October 1963

CONDITION OF STRUCTURE: Very Good

TYPE OF STRUCTURE: Trash Catcher EVALUATION SITE #: 4-S

WATER ANALYSIS: (before and after installation, note dates)

Date	November 7, 1962	Time	1000
Water Temp.	38° F	Air Temp.	47° F
Oxygen	-	Carbon Dioxide	(T)
Alkalinity (MO)	51 ppm	(Phth)	0.0
Hardness	68 ppm	pH	7.60
Turbidity	10 ppm	Sulfates	15 ppm

Date	May 16, 1963	Time	1200
Water Temp.	64° F	Air Temp.	73° F
Oxygen	-	Carbon Dioxide	(T)
Alkalinity (MO)	51 ppm	(Phth)	0.0
Hardness	51 ppm	pH	7.70
Turbidity	20 ppm	Sulfates	15 ppm

Date	October 21, 1963	Time	1115
Water Temp.	49° F	Air Temp.	53° F
Oxygen	9.3	Carbon Dioxide	(T)
Alkalinity (MO)	68 ppm	(Phth)	0.0
Hardness	51 ppm	pH	7.95
Turbidity	10 ppm	Sulfates	10 ppm

STREAM WIDTH: 28 STREAM FLOW: .3 F/S

DEPTH MEASUREMENTS (facing downstream):

Six feet downstream	1/3 L	5"	M	5.25	1/3 R	3.75
One foot downstream	1/3 L	6	M	11.50	1/3 R	10
Six feet upstream	1/3 L	11.25	M	15.50	1/3 R	8.25
One foot upstream	1/3 L	7.50	M	8.75	1/3 R	6

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis fly) _____

Plecoptera (Stonefly) _____

Ephemeroptera (Mayfly) _____

Coleoptera (Beetle) _____

Hemiptera (Bug) _____

Diptera (Fly) 1 _____

Annelida (Leech) _____ Other _____

LAS HUERTAS CREEK

Las Huertas Creek is located on the Cibola National Forest in Sandoval County, New Mexico. The portion of stream lying within the forest boundary is approximately four miles in length, one mile of which is in private ownership. The headwaters rise in the northeastern slope of the Sandia Mountains and flow in a northwesterly direction through pine-juniper and pinon country. It enters the Rio Grande River near the town of Angostura.

This stream was stocked in 1963 (for the first time in many years) by the New Mexico Department of Game and Fish. The fish stocked were catchable rainbow trout and were distributed among the pools created by the structure improvements. This area gets very heavy use from the populace of the Albuquerque area. The portion of stream mentioned in this report is in the upper section lying in Twp. 12 N. and R. 5 E. The elevation in this portion of stream is approximately 7,200 feet. Located in this same general area is the Las Huertas forest picnic area. One hundred and thirty-two gabion type structures were installed by Forest Service crews in FY 1963.

UNIMPROVED PORTION OF STREAM

STREAM: Las Huertas FOREST: Cibola
 DATE(S) OF EVALUATION: October 1963 CONTROL SITE #: 3C

WATER ANALYSIS:

Date May 9, 1963 Time 1100
 Water Temp. 50° F Air Temp. 66° F
 Oxygen -- Carbon Dioxide 10 ppm
 Alkalinity (MO) 187 ppm (Phth) 0.0
 Hardness -- pH 7.95
 Turbidity 10 ppm Sulfates 24 ppm

Date October 23, 1963 Time 1000
 Water Temp. 43° F Air Temp. 43° F
 Oxygen 8.0 Carbon Dioxide 7 ppm
 Alkalinity (MO) 204 ppm (Phth) 0.0
 Hardness -- pH 8.0
 Turbidity 0.0 Sulfates 22 ppm

STREAM WIDTH: 8 ft. STREAM FLOW: 1 c/s
 DEPTH MEASUREMENTS (facing downstream):
 1/3 L 2.75 M 0.0 1/3 R 4.25

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis) _____ Plecoptera (Stonefly) _____
 Ephemeroptera (Mayfly) _____ Coleoptera (Beetle) _____
 Hemiptera (Bugs) _____ Diptera (Fly) _____
 Annelida (Leech) _____ Other _____





Las Huertas Site #5-S



Las Huertas Site #6-S

STREAM IMPROVEMENT STRUCTURE

STREAM: Las Huertas FOREST: Cibola

DATE INSTALLED: 1962 DATE EVALUATED: October 1963

CONDITION OF STRUCTURE: Good

TYPE OF STRUCTURE: Cahion EVALUATION SITE #: 5-8

WATER ANALYSIS: (before and after installation, note dates)

Date October 19, 1962 Time --
 Water Temp. 47° F Air Temp. 55° F
 Oxygen 8.75 Carbon Dioxide 15 ppm
 Alkalinity (MO) 221 ppm (Phth) 0.0
 Hardness 204 ppm pH 8.3
 Turbidity -- Sulfates 26 ppm

Date May 9, 1963 Time 1000
 Water Temp. 48° F Air Temp. 63° F
 Oxygen -- Carbon Dioxide 10 ppm
 Alkalinity (MO) 187 ppm (Phth) 0.0
 Hardness -- pH 7.85
 Turbidity 5 ppm Sulfates 20 ppm

Date October 29, 1963 Time 0900
 Water Temp. 44° F Air Temp. 63° F
 Oxygen 7.80 Carbon Dioxide 10 ppm
 Alkalinity (MO) 220 ppm (Phth) 0.0
 Hardness -- pH 8.50
 Turbidity 0.0 Sulfates 22 ppm

STREAM WIDTH: 9 STREAM FLOW: 1.4 F/S

DEPTH MEASUREMENTS (facing downstream):

Six feet downstream	1/3 L	7"	M	6"	1/3 R	0
One foot downstream	1/3 L	7.25	M	7	1/3 R	7
Six feet upstream	1/3 L	5.75	M	3.75	1/3 R	5.25
One foot upstream	1/3 L	3.25	M	.5	1/3 R	3.25

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis fly) 1
 Plecoptera (Stonefly) 3
 Ephemeroptera (Mayfly) --
 Coleoptera (Beetle) --
 Hemiptera (Bug) --
 Diptera (Fly) --
 Annelida (Leech) -- Other --

STREAM IMPROVEMENT STRUCTURE

STREAM: Las Huertas FOREST: Cibola

DATE INSTALLED: 1962 DATE EVALUATED: October 1963

CONDITION OF STRUCTURE: Good

TYPE OF STRUCTURE: Gabion EVALUATION SITE #: 6-S

WATER ANALYSIS: (before and after installation, note dates)

Date <u>October 19, 1962</u>	Time <u>-</u>
Water Temp. <u>47</u>	Air Temp. <u>55</u>
Oxygen <u>8.75</u>	Carbon Dioxide <u>15 ppm</u>
Alkalinity (MO) <u>221 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>204 ppm</u>	pH <u>8.3</u>
Turbidity <u>-</u>	Sulfates <u>26 ppm</u>

Date <u>May 9, 1963</u>	Time <u>1300</u>
Water Temp. <u>50° F</u>	Air Temp. <u>63° F</u>
Oxygen <u>-</u>	Carbon Dioxide <u>10 ppm</u>
Alkalinity (MO) <u>170 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>170 ppm</u>	pH <u>7.90</u>
Turbidity <u>10 ppm</u>	Sulfates <u>18 ppm</u>

Date <u>October 29, 1963</u>	Time <u>1050</u>
Water Temp. <u>44° F</u>	Air Temp. <u>58° F</u>
Oxygen <u>7.80</u>	Carbon Dioxide <u>10 ppm</u>
Alkalinity (MO) <u>204 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>-</u>	pH <u>8.0</u>
Turbidity <u>0.0</u>	Sulfates <u>22 ppm</u>

STREAM WIDTH: 7 ft. STREAM FLOW: .36 F/S

DEPTH MEASUREMENTS (facing downstream):

Six feet downstream	1/3 L	6"	M	9.50"	1/3 R	4.25
One foot downstream	1/3 L	6.75	M	6.25	1/3 R	6.25
Six feet upstream	1/3 L	9.25	M	5.50	1/3 R	4.75
One foot upstream	1/3 L	5	M	8.50	1/3 R	7.75

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis fly) _____
Plecoptera (Stonefly) 1 _____
Ephemeroptera (Mayfly) _____
Coleoptera (Beetle) _____
Hemiptera (Bug) _____
Diptera (Fly) _____
Annelida (Leech) _____ Other _____

TAJIQUE CREEK

Tajique Creek is located on the Cibola National Forest in Torrance County, New Mexico. The portion of stream lying within the forest boundary is approximately 6 miles in length, 3 of which are in private ownership. The headwaters rise near Cerro Blanco Peak in the northern part of the Manzano Mountains. The stream flows in a southeasterly direction and disappears in the Estancia Basin flats; it flows through pine, pinyon-juniper and open country.

This stream was first stocked with rainbow trout in 1910. Because of the lack of water, all stockings were stopped from 1949 to 1958. In 1958 catchable rainbow were again stocked in some of the natural pools. In 1962-63, 75 stream improvement structures were installed by Forest Service crews. The section of stream mentioned in this report is near the upper end in Twp. 7 N. and R. 6 E., at an elevation of about 7,400 feet. Two Forest camps are located near this stream; one near the lower portion of the study area and the other on the upper end.

UNIMPROVED PORTION OF STREAM

STREAM: Tajique FOREST: Cibola
 DATE(S) OF EVALUATION: May 1963 CONTROL SITE #: 4-C
 WATER ANALYSIS:

Date <u>May 10, 1963</u>	Time <u>1300</u>
Water Temp. <u>58° F</u>	Air Temp. <u>67° F</u>
Oxygen <u> </u>	Carbon Dioxide <u>10 ppm</u>
Alkalinity (MO) <u>221 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>220 ppm</u>	pH <u>7.90</u>
Turbidity <u>0.0</u>	Sulfates <u>47 ppm</u>

Date <u>October (dried up)</u>	Time <u> </u>
Water Temp. <u> </u>	Air Temp. <u> </u>
Oxygen <u> </u>	Carbon Dioxide <u> </u>
Alkalinity (MO) <u> </u>	(Phth) <u> </u>
Hardness <u> </u>	pH <u> </u>
Turbidity <u> </u>	Sulfates <u> </u>

STREAM WIDTH: 7 STREAM FLOW: .62 F/S

DEPTH MEASUREMENTS (facing downstream):

1/3 L 4 M 8 1/3 R 7

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis) <u>1</u>	Plecoptera (Stonefly) <u> </u>
Ephemeroptera (Mayfly) <u> </u>	Coleoptera (Beetle) <u>2</u>
Hemiptera (Bugs) <u> </u>	Diptera (Fly) <u> </u>
Annelida (Leech) <u> </u>	Other <u>1</u>



Tajique Creek Site #4-C



Tajique Creek Site #7-8



Tajique Creek Site #8-8

STREAM IMPROVEMENT STRUCTURE

STREAM: Taiique FOREST: Cibola

DATE INSTALLED: 1962 DATE EVALUATED: May 1963

CONDITION OF STRUCTURE: Good

TYPE OF STRUCTURE: Trash Catcher EVALUATION SITE #: 7-S

WATER ANALYSIS: (before and after installation, note dates)

Date <u>May 18, 1962</u>	Time <u>---</u>
Water Temp. <u>50° F</u>	Air Temp. <u>56° F</u>
Oxygen <u>10.3</u>	Carbon Dioxide <u>12 ppm</u>
Alkalinity (MO) <u>238 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>221 ppm</u>	pH <u>7.40</u>
Turbidity <u>0.0</u>	Sulfates <u>49 ppm</u>

Date <u>May 10, 1963</u>	Time <u>1145</u>
Water Temp. <u>56° F</u>	Air Temp. <u>70° F</u>
Oxygen <u>---</u>	Carbon Dioxide <u>10 ppm</u>
Alkalinity (MO) <u>238 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>238 ppm</u>	pH <u>7.95</u>
Turbidity <u>0.0</u>	Sulfates <u>40 ppm</u>

Date <u>October 28, 1963</u>	Time <u>1000</u>
Water Temp. <u>40° F</u>	Air Temp. <u>50° F</u>
Oxygen <u>7.0</u>	Carbon Dioxide <u>25 ppm</u>
Alkalinity (MO) <u>260 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>270 ppm</u>	pH <u>7.95</u>
Turbidity <u>0.0</u>	Sulfates <u>45 ppm</u>

STREAM WIDTH: 7 STREAM FLOW: .34 F/S

DEPTH MEASUREMENTS (facing downstream):

Six feet downstream	1/3 L	<u>4"</u>	M	<u>2.75</u>	1/3 R	<u>2.75</u>
One foot downstream	1/3 L	<u>8.50</u>	M	<u>10.75</u>	1/3 R	<u>10.50</u>
Six feet upstream	1/3 L	<u>15.50</u>	M	<u>16.75</u>	1/3 R	<u>6.50</u>
One foot upstream	1/3 L	<u>7</u>	M	<u>7</u>	1/3 R	<u>6.50</u>

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis fly)	<u>---</u>
Plecoptera (Stonefly)	<u>---</u>
Ephemeroptera (Mayfly)	<u>---</u>
Coleoptera (Beetle)	<u>---</u>
Hemiptera (Bug)	<u>---</u>
Diptera (Fly)	<u>---</u>
Annelida (Leech)	<u>---</u>
Other	<u>2</u>

STREAM IMPROVEMENT STRUCTURE

STREAM: Tajique FOREST: Cibola

DATE INSTALLED: 1962 DATE EVALUATED: October 1963

CONDITION OF STRUCTURE: Good

TYPE OF STRUCTURE: Trash Catcher EVALUATION SITE #: 8-S

WATER ANALYSIS: (before and after installation, note dates)

Date <u>May 18, 1963</u>	Time <u>-</u>
Water Temp. <u>50° F</u>	Air Temp. <u>56° F</u>
Oxygen <u>10.3</u>	Carbon Dioxide <u>12 ppm</u>
Alkalinity (MO) <u>238 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>221 ppm</u>	pH <u>7.40</u>
Turbidity <u>0.0</u>	Sulfates <u>49 ppm</u>

Date <u>May (not est.)</u>	Time <u></u>
Water Temp. <u></u>	Air Temp. <u></u>
Oxygen <u></u>	Carbon Dioxide <u></u>
Alkalinity (MO) <u></u>	(Phth) <u></u>
Hardness <u></u>	pH <u></u>
Turbidity <u></u>	Sulfates <u></u>

Date <u>October 28, 1963</u>	Time <u>1400</u>
Water Temp. <u>45° F</u>	Air Temp. <u>45° F (rain)</u>
Oxygen <u>7.10</u>	Carbon Dioxide <u></u>
Alkalinity (MO) <u>300 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>306 ppm</u>	pH <u>7.95</u>
Turbidity <u>0.0</u>	Sulfates <u>47 ppm</u>

STREAM WIDTH: 7 ft. STREAM FLOW: Nil

DEPTH MEASUREMENTS (facing downstream):

Six feet downstream	1/3 L	<u>0"</u>	M	<u>1.5"</u>	1/3 R	<u>0"</u>
One foot downstream	1/3 L	<u>4.75</u>	M	<u>5.50</u>	1/3 R	<u>5.25</u>
Six feet upstream	1/3 L	<u>5</u>	M	<u>9.25</u>	1/3 R	<u>10.25</u>
One foot upstream	1/3 L	<u>5.50</u>	M	<u>8</u>	1/3 R	<u>10</u>

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis fly)
 Plecoptera (Stonefly)
 Ephemeroptera (Mayfly)
 Coleoptera (Beetle)
 Hemiptera (Bug)
 Diptera (Fly)
 Annelida (Leech) Other

SOUTH FORK BONITO CREEK

The South Fork is located on the Lincoln National Forest in Lincoln County, New Mexico. All of the stream lies within the forest boundary and is approximately 6 miles in length, less than 1 of which is in private ownership. The headwaters rise just a few miles north of Sierra Blanca Peak and within the White Mountain Wild Area in the White Mountains. It flows in a northeasterly direction and empties into Bonito Creek above Bonito Lake.

The portion of stream mentioned in this report is located in Twp. 10 S. and R. 11 E. The elevation at this point is between 7,600 and 8,000 feet. Some eastern brook trout inhabit most of this portion of stream. The State stocks catchable rainbow annually. In FY 1963 a cooperative project between the New Mexico Department of Game and Fish and the Forest Service resulted in 140 stream improvement structures being installed; these were installed by Forest Service crews and consisted of trash catcher, log and gabion type structures.

UNIMPROVED PORTION OF STREAM

STREAM: So. Fork Benito FOREST: Lincoln
 DATE(S) OF EVALUATION: October 1963 CONTROL SITE #: 5-C

WATER ANALYSIS:

Date <u>July 31, 1963</u>	Time <u>1350</u>
Water Temp. <u>66° F</u>	Air Temp. <u>---</u>
Oxygen <u>7.9</u>	Carbon Dioxide <u>(N)</u>
Alkalinity (MO) <u>51 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>51 ppm</u>	pH <u>7.95</u>
Turbidity <u>0.0</u>	Sulfates <u>80 ppm</u>

Date <u>October 30, 1963</u>	Time <u>1200</u>
Water Temp. <u>50</u>	Air Temp. <u>57</u>
Oxygen <u>7.50</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>42 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>85 ppm</u>	pH <u>7.50</u>
Turbidity <u>0.0</u>	Sulfates <u>74 ppm</u>

STREAM WIDTH: 15 ft. STREAM FLOW: .82 f/s

DEPTH MEASUREMENTS (facing downstream):

1/3 L 4.25" M 7.75" 1/3 R 3.25"

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis)	Plecoptera (Stonefly)
Ephemeroptera (Mayfly)	Coleoptera (Beetle)
Hemiptera (Bugs)	Diptera (Fly) <u>1</u>
Annelida (Leech)	Other



South Fork Benito Site #5-C



So. Fork Bonito Site #9-S



So. Fork Bonito Site #10-S

STREAM IMPROVEMENT STRUCTURE

STREAM: So. Fork Bonito FOREST: Lincoln

DATE INSTALLED: 1962 DATE EVALUATED: October 1963

CONDITION OF STRUCTURE: Very Good

TYPE OF STRUCTURE: Double Log EVALUATION SITE #: 9-S

WATER ANALYSIS: (before and after installation, note dates)

Date <u>July 23, 1962</u>	Time <u> </u>
Water Temp. <u>56° F</u>	Air Temp. <u> </u>
Oxygen <u> </u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>34 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>68 ppm</u>	pH <u>7.45</u>
Turbidity <u>12 ppm</u>	Sulfates <u>60 ppm</u>

Date <u> </u>	Time <u> </u>
Water Temp. <u> </u>	Air Temp. <u> </u>
Oxygen <u> </u>	Carbon Dioxide <u> </u>
Alkalinity (MO) <u> </u>	(Phth) <u> </u>
Hardness <u> </u>	pH <u> </u>
Turbidity <u> </u>	Sulfates <u> </u>

Date <u>October 30, 1960</u>	Time <u>1330</u>
Water Temp. <u>50</u>	Air Temp. <u>59</u>
Oxygen <u>7.2</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>42 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>85 ppm</u>	pH <u>7.60</u>
Turbidity <u>0.0</u>	Sulfates <u>74 ppm</u>

STREAM WIDTH: 20 Ft. STREAM FLOW: .30 F/S

DEPTH MEASUREMENTS (facing downstream):

Six feet downstream	1/3 L <u>0"</u>	M <u>.75"</u>	1/3 R <u>5.75"</u>
One foot downstream	1/3 L <u>5"</u>	M <u>10</u>	1/3 R <u>4.25</u>
Six feet upstream	1/3 L <u>12</u>	M <u>11.75</u>	1/3 R <u>13</u>
One foot upstream	1/3 L <u>5</u>	M <u>7</u>	1/3 R <u>13</u>

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis fly)	<u> </u>
Plecoptera (Stonefly)	<u>5</u>
Ephemeroptera (Mayfly)	<u> </u>
Coleoptera (Beetle)	<u>2</u>
Hemiptera (Bug)	<u> </u>
Diptera (Fly)	<u>5</u>
Annelida (Leech)	<u> </u> Other <u> </u>

STREAM IMPROVEMENT STRUCTURE

STREAM: So. Fork Bonito FOREST: Lincoln

DATE INSTALLED: 1962 DATE EVALUATED: October 1963

CONDITION OF STRUCTURE: Good

TYPE OF STRUCTURE: Trash Catcher EVALUATION SITE #: 10-S

WATER ANALYSIS: (before and after installation, note dates)

Date	July 23, 1962	Time	-
Water Temp.	56° F	Air Temp.	-
Oxygen	-	Carbon Dioxide	(T)
Alkalinity (MO)	34 ppm	(Phth)	0.0
Hardness	68 ppm	pH	7.45
Turbidity	12 ppm	Sulfates	60 ppm

Date _____	Time _____
Water Temp. _____	Air Temp. _____
Oxygen _____	Carbon Dioxide _____
Alkalinity (MO) _____	(Phth) _____
Hardness _____	pH _____
Turbidity _____	Sulfates _____

Date	October 30, 1963	Time	1430
Water Temp.	52° F	Air Temp.	57° F
Oxygen	7.4	Carbon Dioxide	(T)
Alkalinity (MO)	42 ppm	(Phth)	0.0
Hardness	102 ppm	pH	7.2
Turbidity	0.0	Sulfates	74 ppm

STREAM WIDTH: 11 Ft. STREAM FLOW: .30 F/S

DEPTH MEASUREMENTS (facing downstream):

					inches			
Six feet downstream	1/3	L	1.5"	M	1.5"	1/3	R	1.75"
One foot downstream	1/3	L	5	M	6.25	1/3	R	7.50
Six feet upstream	1/3	L	10.5	M	8.25	1/3	R	6.75
One foot upstream	1/3	L	5.25	M	9.25	1/3	R	6.75

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT): None

Trichoptera (Caddis fly) _____
Plecoptera (Stonefly) _____
Ephemeroptera (Mayfly) _____
Coleoptera (Beetle) _____
Hemiptera (Bug) _____
Diptera (Fly) _____
Annelida (Leech) _____ Other _____

EAGLE CREEK

Eagle Creek is located on the Lincoln National Forest in Lincoln County, New Mexico. The portion of stream lying within the forest boundary is approximately 14 miles in length, 2 of which are in private ownership. The headwaters rise in the White Mountains at about 8,000 feet elevation. The flow is in an easterly direction and empties into the Ruidoso River near Glencoe. The upper drainage area consists of spruce-pine and fir; the middle and lower portions are pinon, juniper and grasslands.

This stream has provided a very limited trout fishery since its first stocking by the U. S. in 1896. Catchable rainbow are presently stocked in the upper 4 miles of stream. During 1963 the Forest Service built 119 trash catcher type structures in an attempt to add additional pools for an expanded fishery. The section of stream mentioned in this report is in Twp. 10 S. and R. 11 and 12 E. Two Forest Service camp picnic areas and a ski run are located near this general area.

UNIMPROVED PORTION OF STREAM

STREAM: Eagle Creek FOREST: Lincoln
 DATE(S) OF EVALUATION: October 1963 CONTROL SITE #: 6-C
 WATER ANALYSIS:

Date <u>August 1, 1963</u>	Time <u>0945</u>
Water Temp. <u>58° F</u>	Air Temp. <u>--</u>
Oxygen <u>--</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>51 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>51 ppm</u>	pH <u>7.8</u>
Turbidity <u>0.0</u>	Sulfates <u>72 ppm</u>

Date <u>October 31, 1963</u>	Time <u>0945</u>
Water Temp. <u>49° F</u>	Air Temp. <u>53° F</u>
Oxygen <u>7.8</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>51 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>85 ppm</u>	pH <u>7.9</u>
Turbidity <u>0.0</u>	Sulfates <u>72 ppm</u>

STREAM WIDTH: 5 STREAM FLOW: 1 F/S
 DEPTH MEASUREMENTS (facing downstream):

1/3 L 1.75" M 3" 1/3 R 1"

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis)	Plecoptera (Stonefly)
Ephemeroptera (Mayfly)	Coleoptera (Beetle)
Hemiptera (Bugs)	Diptera (Fly)
Annelida (Leech)	Other <u>1</u>



Eagle Creek Site #6-C



Eagle Creek Site #11-8



Eagle Creek Site #12-8 (Oct.)
(See next sheet for Aug. photo)

STREAM IMPROVEMENT STRUCTURE

STREAM: Eagle Creek FOREST: Lincoln

DATE INSTALLED: 1963 DATE EVALUATED: October 1963

CONDITION OF STRUCTURE: Very Good

TYPE OF STRUCTURE: Trash Catcher EVALUATION SITE #: 11-S

WATER ANALYSIS: (before and after installation, note dates)

Date November 1, 1963 Time ---
 Water Temp. 47° F Air Temp. ---
 Oxygen --- Carbon Dioxide (T)
 Alkalinity (MO) 51 ppm (Phth) 0.0
 Hardness 102 ppm pH 7.3
 Turbidity 5 ppm Sulfates 70 ppm

Date August 1, 1963 Time 1030
 Water Temp. 67° F Air Temp. ---
 Oxygen --- Carbon Dioxide 5 ppm
 Alkalinity (MO) 51 ppm (Phth) 0.0
 Hardness 51 ppm pH 7.65
 Turbidity 0.0 Sulfates 82 ppm

Date October 31, 1963 Time 1000
 Water Temp. 51° F Air Temp. 62° F
 Oxygen 7.5 Carbon Dioxide (T)
 Alkalinity (MO) 68 ppm (Phth) 0.0
 Hardness 120 ppm pH 7.9
 Turbidity 0.0 Sulfates 85 ppm

STREAM WIDTH: 18 ft. STREAM FLOW: .30 F/S

DEPTH MEASUREMENTS (facing downstream):

Six feet downstream	1/3 L	<u>1"</u>	M	<u>1"</u>	1/3 R	<u>.5"</u>
One foot downstream	1/3 L	<u>4.5</u>	M	<u>9.25</u>	1/3 R	<u>3.25</u>
Six feet upstream	1/3 L	<u>12.5</u>	M	<u>14.25</u>	1/3 R	<u>7.25</u>
One foot upstream	1/3 L	<u>13.75</u>	M	<u>13.75</u>	1/3 R	<u>7.50</u>

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis fly) _____
 Plecoptera (Stonefly) _____
 Ephemeroptera (Mayfly) _____
 Coleoptera (Beetle) 2 _____
 Hemiptera (Bug) _____
 Diptera (Fly) 1 _____
 Annelida (Leech) _____ Other _____



Eagle Creek Site #12-S (Aug.)
Compare depth measurements for
same site on prior sheet.

Additional Sheet for 12-S
(Road building results)
Depth measurements only

STREAM IMPROVEMENT STRUCTURE

STREAM: Eagle Creek FOREST: Lincoln

DATE INSTALLED: 1963 DATE EVALUATED: August & Oct. 1963

CONDITION OF STRUCTURE: Good (August)

TYPE OF STRUCTURE: Trash Catcher EVALUATION SITE #: 12-S

WATER ANALYSIS: (before and after installation, note dates)

Date _____	Time _____
Water Temp. _____	Air Temp. _____
Oxygen _____	Carbon Dioxide _____
Alkalinity (MO) _____	(Phth) _____
Hardness _____	pH _____
Turbidity _____	Sulfates _____

Date <u>August 1, 1963</u>	Time <u>1230</u>
Water Temp. <u>67° F</u>	Air Temp. <u>---</u>
Oxygen <u>---</u>	Carbon Dioxide <u>8 ppm</u>
Alkalinity (MO) <u>120 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>120 ppm</u>	pH <u>7.85</u>
Turbidity <u>68 (road build- ing)</u>	Sulfates <u>110 ppm</u>

Date _____	Time _____
Water Temp. _____	Air Temp. _____
Oxygen _____	Carbon Dioxide _____
Alkalinity (MO) _____	(Phth) _____
Hardness _____	pH _____
Turbidity _____	Sulfates _____

STREAM WIDTH: 13 ft. STREAM FLOW: .5 F/S (Aug.)

*DEPTH MEASUREMENTS (facing downstream): August 1963

Six feet downstream	1/3 L	<u>6.5"</u>	M	<u>9"</u>	1/3 R	<u>7"</u>
One foot downstream	1/3 L	<u>9.5</u>	M	<u>14.25</u>	1/3 R	<u>11</u>
Six feet upstream	1/3 L	<u>13.25</u>	M	<u>16.50</u>	1/3 R	<u>12.25</u>
One foot upstream	1/3 L	<u>22.55</u>	M	<u>20.0</u>	1/3 R	<u>14.75</u>

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis fly) _____
Plecoptera (Stonefly) _____
Ephemeroptera (Mayfly) _____
Coleoptera (Beetle) _____
Hemiptera (Bug) _____
Diptera (Fly) _____
Annelida (Leech) _____ Other _____

*See "Findings and Conclusions (1963)."

STREAM IMPROVEMENT STRUCTURE

STREAM: Eagle Creek FOREST: Lincoln

DATE INSTALLED: 1963 DATE EVALUATED: October 1963

CONDITION OF STRUCTURE: Fair (August)

TYPE OF STRUCTURE: Trash catcher EVALUATION SITE #: 12-S

WATER ANALYSIS: (before and after installation, note dates)

Date <u>November 1, 1962</u>	Time <u>-</u>
Water Temp. <u>47° F</u>	Air Temp. <u>-</u>
Oxygen <u>-</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>51 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>102 ppm</u>	pH <u>7.3</u>
Turbidity <u>5 ppm</u>	Sulfates <u>70 ppm</u>

Date <u>August 1, 1963</u>	Time <u>1230</u>
Water Temp. <u>67° F</u>	Air Temp. <u>-</u>
Oxygen <u>-</u>	Carbon Dioxide <u>8 ppm</u>
Alkalinity (MO) <u>120 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>120 ppm</u>	pH <u>7.85</u>
Turbidity <u>68 (road build- ing)</u>	Sulfates <u>110 ppm</u>

Date <u>October 31, 1963</u>	Time <u>1050</u>
Water Temp. <u>53</u>	Air Temp. <u>57</u>
Oxygen <u>7.6</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>102 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>153 ppm</u>	pH <u>7.75</u>
Turbidity <u>0.0</u>	Sulfates <u>72 ppm</u>

STREAM WIDTH: 7 STREAM FLOW: 1.4 F/S (Oct.)

DEPTH MEASUREMENTS (facing downstream): (October)

				inches	
Six feet downstream	1/3 L	<u>2"</u>	M	<u>2"</u>	1/3 R <u>2.50"</u>
One foot downstream	1/3 L	<u>15</u>	M	<u>15.75</u>	1/3 R <u>12</u>
Six feet upstream	1/3 L	<u>1.5</u>	M	<u>.5</u>	1/3 R <u>1.25</u>
One foot upstream	1/3 L	<u>4.50</u>	M	<u>2.75</u>	1/3 R <u>3.25</u>

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT): (Oct.)

Trichoptera (Caddis fly) _____
Plecoptera (Stonefly) _____
Ephemeroptera (Mayfly) _____
Coleoptera (Beetle) _____
Hemiptera (Bug) _____
Diptera (Fly) 5 _____
Annelida (Leech) _____ Other _____

RIO EN MEDIO

The Rio En Medio is located on the Santa Fe National Forest in Santa Fe County, New Mexico. The portion of stream lying within the forest boundary is approximately 6 miles, 3 of which are in private ownership. The headwaters rise near Lake Peak in the Sangre De Cristo Mountains and flow in a northwesterly direction where it empties into the Rio Nambe near the town of Nambe. The surrounding upper vegetation consists of spruce, fir, pine with juniper and open grasslands in the lower portion.

The section of stream mentioned in this report is located in Twp. 18 N. and R. 11 E. The elevation is at about 8,000 to 9,000 feet. This stream is presently stocked by the State with catchable rainbow trout. In 1961-62 the Forest Service installed over two hundred log and rock structures. Also located in this area is the Santa Fe Ski Basin and two forest camp picnic areas.

UNIMPROVED PORTION OF STREAM

STREAM: Rio En Medio FOREST: Santa Fe
 DATE(S) OF EVALUATION: October 1963 CONTROL SITE #: 7-C
 WATER ANALYSIS:

Date _____	Time _____
Water Temp. _____	Air Temp. _____
Oxygen _____	Carbon Dioxide _____
Alkalinity (MO) _____	(Phth) _____
Hardness _____	pH _____
Turbidity _____	Sulfates _____

Date <u>October 23, 1963</u>	Time <u>0900</u>
Water Temp. <u>40° F</u>	Air Temp. <u>46° F</u>
Oxygen <u>7.5</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>34 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>17 ppm</u>	pH <u>7.15</u>
Turbidity <u>0.0</u>	Sulfates <u>12 ppm</u>

STREAM WIDTH: 6 STREAM FLOW: 1.1 F/S
 DEPTH MEASUREMENTS (facing downstream):
 1/3 L 5.25" M 5.50" 1/3 R 2.50"
 INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis) _____	Plecoptera (Stonefly) _____
Ephemeroptera (Mayfly) _____	Coleoptera (Beetle) _____
Hemiptera (Bugs) _____	Diptera (Fly) _____
Annelida (Leech) _____	Other _____



Rio En Medio Site #7-C



Rio En Medio Site #13-S



Rio En Medio Site #14-S

STREAM IMPROVEMENT STRUCTURE

STREAM: Rio En Medio FOREST: Santa Fe

DATE INSTALLED: 1961 DATE EVALUATED: October 1963

CONDITION OF STRUCTURE: Fair

TYPE OF STRUCTURE: Single Log EVALUATION SITE #: 13-S

WATER ANALYSIS: (before and after installation, note dates)

Date <u>July 9, 1962</u>	Time <u>---</u>
Water Temp. <u>56° F</u>	Air Temp. <u>---</u>
Oxygen <u>---</u>	Carbon Dioxide <u>---</u>
Alkalinity (MO) <u>27 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>---</u>	pH <u>7.1</u>
Turbidity <u>5 ppm</u>	Sulfates <u>20 ppm</u>

Date <u>July 8, 1963</u>	Time <u>---</u>
Water Temp. <u>52° F</u>	Air Temp. <u>---</u>
Oxygen <u>---</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>34 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>34 ppm</u>	pH <u>7.05</u>
Turbidity <u>30 ppm</u>	Sulfates <u>14 ppm</u>

Date <u>October 23, 1963</u>	Time <u>0900</u>
Water Temp. <u>38° F</u>	Air Temp. <u>39° F</u>
Oxygen <u>7.0</u>	Carbon Dioxide <u>---</u>
Alkalinity (MO) <u>17 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>17 ppm</u>	pH <u>7.15</u>
Turbidity <u>0.0</u>	Sulfates <u>12 ppm</u>

STREAM WIDTH: 4 STREAM FLOW: 1.3 F/S

DEPTH MEASUREMENTS (facing downstream):

Six feet downstream	1/3 L	<u>2"</u>	M	<u>7"</u>	1/3 R	<u>6.5"</u>
One foot downstream	1/3 L	<u>8.5</u>	M	<u>15</u>	1/3 R	<u>18</u>
Six feet upstream	1/3 L	<u>7</u>	M	<u>4.5</u>	1/3 R	<u>2.5</u>
One foot upstream	1/3 L	<u>4.5</u>	M	<u>4.5</u>	1/3 R	<u>4.75</u>

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis fly)	<u>1</u>
Plecoptera (Stonefly)	<u>1</u>
Ephemeroptera (Mayfly)	<u>---</u>
Coleoptera (Beetle)	<u>---</u>
Hemiptera (Bug)	<u>---</u>
Diptera (Fly)	<u>---</u>
Annelida (Leech)	<u>---</u>
Other	<u>---</u>

STREAM IMPROVEMENT STRUCTURE

STREAM: Rio En Medio FOREST: Santa Fe

DATE INSTALLED: 1963 DATE EVALUATED: October 1963

CONDITION OF STRUCTURE: Very good

TYPE OF STRUCTURE: Double log EVALUATION SITE #: 14-S

WATER ANALYSIS: (before and after installation, note dates)

Date <u>July 9, 1962</u>	Time <u>-</u>
Water Temp. <u>56° F</u>	Air Temp. <u>-</u>
Oxygen <u>-</u>	Carbon Dioxide <u>-</u>
Alkalinity (MO) <u>27 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>-</u>	pH <u>7.1</u>
Turbidity <u>5 ppm</u>	Sulfates <u>20 ppm</u>

Date <u>July 8, 1963</u>	Time <u>-</u>
Water Temp. <u>54° F</u>	Air Temp. <u>-</u>
Oxygen <u>-</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>34 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>34 ppm</u>	pH <u>7.25</u>
Turbidity <u>40 ppm</u>	Sulfates <u>12 ppm</u>

Date <u>October 23, 1963</u>	Time <u>1030</u>
Water Temp. <u>40° F</u>	Air Temp. <u>46° F</u>
Oxygen <u>7.4</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>17 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>25 ppm</u>	pH <u>6.9</u>
Turbidity <u>0.0</u>	Sulfates <u>14 ppm</u>

STREAM WIDTH: 9 STREAM FLOW: .22 F/S

DEPTH MEASUREMENTS (facing downstream):

		inches			
Six feet downstream	1/3 L	8.25"	M	7.50"	1/3 R 10"
One foot downstream	1/3 L	10.50	M	17	1/3 R 10.50
Six feet upstream	1/3 L	17	M	15	1/3 R 13.75
One foot upstream	1/3 L	8	M	9.25	1/3 R 10

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT): None

Trichoptera (Caddis fly) _____

Plecoptera (Stonefly) _____

Ephemeroptera (Mayfly) _____

Coleoptera (Beetle) _____

Hemiptera (Bug) _____

Diptera (Fly) _____

Annelida (Leech) _____ Other _____

RIO LAS VACAS

The Rio Las Vacas is located on the Santa Fe National Forest in Sandoval and Rio Arriba Counties, New Mexico. The portion of stream lying within the forest boundary is approximately 20 miles in length, 5 of which are in other ownership. The headwaters rise in the San Pedro Mountains and flow in a southeasterly direction through spruce, fir and pine country. Shortly after leaving the forest boundary it empties into the Rio Guadalupe about 15 miles north of the town of Jemez.

During the past several years, the State has stocked rainbow, cutthroat and browns. The increased fishing pressure and lack of natural pools has resulted in the installation of approximately 100 trash catcher and log type structures by the New Mexico Department of Game and Fish and Forest Service. This portion of stream is located in Twp. 20 N. and R. 1 E. at an approximate elevation of 8,000 feet. Also located in this general area are three forest camp picnic grounds.

UNIMPROVED PORTION OF STREAM

STREAM: Rio Las Vegas FOREST: Santa Fe
 DATE(S) OF EVALUATION: October 1963 CONTROL SITE #: 9.5
 WATER ANALYSIS:

Date _____	Time _____
Water Temp. _____	Air Temp. _____
Oxygen _____	Carbon Dioxide _____
Alkalinity (MO) _____	(Phth) _____
Hardness _____	pH _____
Turbidity _____	Sulfates _____

Date <u>October 24, 1963</u>	Time <u>1230</u>
Water Temp. <u>50° F</u>	Air Temp. <u>61° F</u>
Oxygen <u>6.5</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>51 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>51 ppm</u>	pH <u>8.3</u>
Turbidity <u>0.0</u>	Sulfates <u>---</u>

STREAM WIDTH: 19 ft. STREAM FLOW: 1.5 F/S

DEPTH MEASUREMENTS (facing downstream):

1/3 L 3.25" M 3.50" 1/3 R 2.75"

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis) _____	Plecoptera (Stonefly) <u>1</u>
Ephemeroptera (Mayfly) _____	Coleoptera (Beetle) _____
Hemiptera (Bugs) _____	Diptera (Fly) _____
Annelida (Leech) _____	Other <u>20 (snails)</u>



Rio Las Vegas Site #8-C



Rio Las Vacas Site #15-S



Rio Las Vacas Site #16-S

STREAM IMPROVEMENT STRUCTURE

STREAM: Rio Las Vacas FOREST: Santa Fe

DATE INSTALLED: 1962 DATE EVALUATED: October 1963

CONDITION OF STRUCTURE: Good

TYPE OF STRUCTURE: Trash Catcher EVALUATION SITE #: 15-8

WATER ANALYSIS: (before and after installation, note dates)

Date <u>October 1, 1962</u>	Time <u>--</u>
Water Temp. <u>50° F</u>	Air Temp. <u>58° F</u>
Oxygen <u>--</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>34 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>34 ppm</u>	pH <u>7.4</u>
Turbidity <u>--</u>	Sulfates <u>28 ppm</u>

Date <u>May 2, 1963</u>	Time <u>--</u>
Water Temp. <u>46° F</u>	Air Temp. <u>62° F</u>
Oxygen <u>--</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>17 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>17 ppm</u>	pH <u>6.9</u>
Turbidity <u>42 ppm</u>	Sulfates <u>12 ppm</u>

Date <u>October 24, 1963</u>	Time <u>1100</u>
Water Temp. <u>46° F</u>	Air Temp. <u>52° F</u>
Oxygen <u>7.4</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>34 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>--</u>	pH <u>7.15</u>
Turbidity <u>0.0</u>	Sulfates <u>--</u>

STREAM WIDTH: 20 ft. STREAM FLOW: .5 F/S

DEPTH MEASUREMENTS (facing downstream):

Six feet downstream	1/3 L	<u>5.75"</u>	M	<u>9.50"</u>	1/3 R	<u>5"</u>
One foot downstream	1/3 L	<u>5.50</u>	M	<u>9.25</u>	1/3 R	<u>8</u>
Six feet upstream	1/3 L	<u>17</u>	M	<u>20.75</u>	1/3 R	<u>14.50</u>
One foot upstream	1/3 L	<u>7.75</u>	M	<u>13.50</u>	1/3 R	<u>5</u>

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis fly) _____
Plecoptera (Stonefly) _____
Ephemeroptera (Mayfly) _____
Coleoptera (Beetle) _____
Hemiptera (Bug) _____
Diptera (Fly) _____
Annelida (Leech) _____ Other 1 (snail)

STREAM IMPROVEMENT STRUCTURE

STREAM: Rio Las Vacas FOREST: Santa Fe

DATE INSTALLED: 1962 DATE EVALUATED: October 1963

CONDITION OF STRUCTURE: Good

TYPE OF STRUCTURE: Trash catcher EVALUATION SITE #: 16-S

WATER ANALYSIS: (before and after installation, note dates)

Date <u>October 1, 1962</u>	Time <u>-</u>
Water Temp. <u>50° F</u>	Air Temp. <u>58° F</u>
Oxygen <u>-</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>34 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>34 ppm</u>	pH <u>7.4</u>
Turbidity <u>-</u>	Sulfates <u>28 ppm</u>

Date <u>May 3, 1963</u>	Time <u>-</u>
Water Temp. <u>58° F</u>	Air Temp. <u>64° F</u>
Oxygen <u>-</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>51 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>51 ppm</u>	pH <u>7.5</u>
Turbidity <u>50 ppm</u>	Sulfates <u>17 ppm</u>

Date <u>October 24, 1963</u>	Time <u>-</u>
Water Temp. <u>53° F</u>	Air Temp. <u>68° F</u>
Oxygen <u>8.0</u>	Carbon Dioxide <u>(T)</u>
Alkalinity (MO) <u>90 ppm</u>	(Phth) <u>0.0</u>
Hardness <u>90 ppm</u>	pH <u>8.10</u>
Turbidity <u>0.0</u>	Sulfates <u>-</u>

STREAM WIDTH: 30 STREAM FLOW: .3 F/S

DEPTH MEASUREMENTS (facing downstream):

					inches
Six feet downstream	1/3 L	7"	M	6"	1/3 R 10.25"
One foot downstream	1/3 L	5.50"	M	7	1/3 R 8
Six feet upstream	1/3 L	8	M	12.50	1/3 R 6.75
One foot upstream	1/3 L	6.25	M	12.50	1/3 R 6

INSECT COUNT (1 SQ. FT./10 MIN. DRIFT):

Trichoptera (Caddis fly)	
Plecoptera (Stonefly)	
Ephemeroptera (Mayfly)	
Coleoptera (Beetle)	
Hemiptera (Bug)	<u>1</u>
Diptera (Fly)	
Annelida (Leech)	
Other	<u>5 (snails)</u>